J Gastrointest Surg (2008) 12:1318–1320
DOI 10.1007/s11605-008-0489-8

Acute Diverticulitis of the Left Colon: Value of the Initial CT and Timing of Elective Colectomy

Patrick Ambrosetti

Received: 11 January 2008 / Accepted: 18 January 2008 / Published online: 29 April 2008

Abstract Computed Tomography is undeniably the most useful tool to confirm the suspected diagnosis of acute left-colonic diverticulitis and to objectively grade its severity into moderate diverticulitis (no signs of colonic perforation) and severe diverticulitis (signs of colonic perforation). Indeed, the severity of acute diverticulitis is statistically predictive of the risk both to need surgical treatment of the first episode of acute diverticulitis, and to follow a complicated evolution after successful conservative treatment of the acute phase. Consequently, CT brings a major contribution to define the place of surgery during the acute phase of diverticulitis, and, later on, inside the long-term evolution of the disease after initial successful conservative treatment.

Keywords Acute diverticulitis · CT · Elective colectomy

In 1990, in the early phase of our prospective experience with acute sigmoid diverticulitis, our first publication was entitled "Vol de nuit" (Night flight).[1] This reflected the chaotic state of knowledge in the management of acute diverticulitis.. We present in this paper the results of a prospective study examining treatment of acute diverticulitis, where many of the questions regarding the treatment of acute diverticulitis are answered. Between October1986 and 1997, we enrolled 542 patients in a prospective study at the University Hospital of Geneva. These patients (290 women and 252 men with a mean age of 64 years) were all admitted to our emergency center with a history and clinical findings suggestive of acute sigmoid diverticulitis. Apart from the patients requiring immediate surgery, all other patients underwent an abdominopelvic computed tomography (CT) and a water-soluble contrast enema (CE) within 72 h of admission. Radiological images were interpreted by radiologists blinded to clinical information. Diverticulitis was classified moderate or severe according to the following radiographic criteria: (1) CT scan—moderate diverticulitis was defined as a localized thickening of the colonic wall of 5 mm or more and signs of inflammation of the pericolic fat and severe diverticulitis was defined as colonic thickening with abscess and/or extraluminal air and/or extraluminal contrast; (2) CE—moderate diverticulitis was defined as a segmental lumen narrowing, a tethered mucosa with or without a mass effect and severe diverticulitis was defined when extravasation of contrast and/or the presence of extraluminal air were added to the former signs. Patients were included in the study when one or both radiological examinations were positive for diverticulitis or when it was histologically proven. After emergency evaluation, all patients were hospitalized in our surgical clinic. Conservative treatment consisted of 10 days of intravenous antibiotics, active against Gram-negative and anaerobic bacteria. The decision for conservative management or surgical intervention was determined by the surgical team.

This study is unique in four ways. First, it represents a selected group of patients with moderate to severe diverticulitis requiring hospitalization. Secondly, because Geneva has only one university hospital being in charge of about 600,000 people, these patients could not be hospitalized in another center, reducing the risk of selection bias. Thirdly, each patient admitted to our emergency unit with abdominal pain is always referred to one of our

This paper was originally presented as part of the SSAT/AGA/ASGE State-of-the-Art Conference on Management Of Diverticular Disease at the SSAT 47th Annual Meeting, May 2006, in Los Angeles, California.

P. Ambrosetti (✉)
University Hospital of Geneva,
Geneva, Switzerland
e-mail: pambrosetti@gntmed.ch

digestive surgeons. When acute diverticulitis is suspected, even if at first no surgical treatment is considered and the patient is sufficiently ill to warrant hospitalization, she or he will be directly admitted in our surgical unit. Finally, the diagnosis was confirmed in all patients with CT or CE, reducing the probability of false-positive rate, which occurs when the diagnosis is made on clinical grounds alone (50% of cases).[2,3]

We examined the role of CT to define the indications for elective colectomy after successful conservative management of a first episode of acute diverticulitis.

The Value of CT

In our prospective study based on 423 patients, of whom 355 had a CT, the value of initial CT in terms of diagnostic sensitivity, probability of failure of conservative treatment during the first hospitalization, and risk of complications after successful conservative treatment of the first acute episode was measured. Of the 132 patients who had a CT and in whom diverticulitis was proven at operation, the CT findings were truly positive in 123 cases, falsely negative in 4 cases, and falsely positive in 5, giving a sensitivity of 97%. Specificity could not be calculated because true negative cases were excluded by the criteria of inclusion. Of the 79 patients who were first treated with conservative treatment and later needed surgical treatment for clinical deterioration (failed medical treatment), 42 had a CT. Of these 42 patients, 32 (76%) had severe diverticulitis by CT scan, compared with 74 (24%) of 303 who had successful medical treatment ($p<0.0001$). Of the 106 patients with CT-severe diverticulitis, 32 (30%) required early operation compared with only 10 (4%) of 239 patients with CT-moderate diverticulitis ($p<0.0001$). Finally initial CT was found statistically predictive of high risk of secondary complications after initial successful medical treatment of acute diverticulitis [with a median follow-up of 46 months, CT-severe diverticulitis was present in 28 (47%) of 60 patients with secondary complications and in 44 (19%) of the 236 who had no complications ($p<0.0001$)].[4] This latter prognostic value was confirmed on long-term follow-up (9.5 years) of 118 patients where we found that the incidence of remote complications was the highest (54% at 5 years) for young patients with CT-severe diverticulitis and the lowest (19% at 5 years) for older patients with CT-moderate diverticulitis. In a univariate analysis, CT-severity and age were both significant, while when stratified for severity of CT, age was no longer significant.[5] We examined the CE to determine if it added to the CT scan in the management of these patients.. This is now dated because recent studies have clearly demonstrated the superiority of CT. It was reported in 2000 the clear superiority of CT compared to water-soluble CE in terms of sensitivity (98 vs 92%; $p<0.01$) and in diagnosing severe inflammation (26 vs 9%; $p<0.02$).[6]

Our experience on the crucial roles of CT in the evaluation of acute diverticulitis have been reported recently.[7]

The Place of Elective Colectomy

The timing of elective sigmoid resection and the risks of the medical management of the disease is still subject to debate.[8,9] The discussion is further complicated by the introduction of laparoscopic colectomy, with excellent immediate results in terms of morbidity, mortality, and cosmetic results.[10]

Many authorities agree that the indications for elective surgery include (1) patients with two or more previous acute attacks treated conservatively; (2) patients with one attack that is associated either with a contained perforation, or colonic obstruction, or with a fistula; (3) patients with a suspicion of colonic cancer that cannot be excluded by other means; and (4) immunocompromised patients, who should have surgery after the first episode. Surgery for younger patients after a first episode of acute diverticulitis is still a controversial topic.[11–13] These recommendations were based on the 40-year-old retrospective Parks'[14] study finding that chances of successful conservative treatment of acute diverticulitis were decreasing with recurrences. We used our prospective database to review these recommendations. Others have reported modern experiences with this disease.

Guzzo et al.,[15] retrospectively studied a group of 196 patients aged 50 years or younger successfully treated conservatively for a sigmoid diverticulitis and found after a median follow-up of 5.2 years that only 1 patient (0.5%) presented at a later date with perforation. Large recent multicentric retrospective studies studying the outcome of patients whose first episode of acute diverticulitis was conservatively treated confirmed that the risk of recurrent attacks was low.[16,17] Studies using statistical models proposed elective colectomy after the third[18] or the fourth attack of acute diverticulitis.[19]

We reported results from l18 patients with long-term follow-up after a first acute episode of sigmoid diverticulitis treated successfully conservatively and found after, a median follow-up of 9.5 years, that no patient died from complications of the disease and that no patient subsequently required emergency surgical treatment.[5] In contrast, in 73 patients who presented with severe diverticulitis and mesocolic (45) or pelvic (28) abscesses associated with acute diverticulitis, 23 (51%) patients with a mesocolic abscess and 20 (71%) of the 28 patients with a pelvic abscess needed surgical treatment either during their first hospitalization or later, after a median of 43 months follow-up. We concluded that sigmoid colectomy after percutaneous drainage was justi-

fied for pelvic abscess, while mesocolic abscess by itself was not an absolute indication for colectomy.[20]

Finally, I would like to stress the importance of accurately diagnosing acute diverticulitis with the use of CT during the acute phase. Most series reporting functional results of patients after elective colectomy are either retrospective and/or do not include CT evidence of diverticulitis. Consequently, the cohort of studied patients is largely altered by false-positive cases that weigh considerably on the interpretation of the results.

Only a few studies, mostly retrospective, centered their interest on functional postoperative results, and none of them had CT-proven diverticulitis.[21–24] These studies found that 7% to 27% of patients followed up between 11 and 48 months were still complaining of abdominal symptoms after colectomy. Authors attributed these persistent symptoms to irritable bowel syndrome,[21,22] insufficient length of resected colon[22] or inappropriate indications to surgery.[23]

Recently, we analyzed by questionnaire the functional results of 43 consecutive patients who had a laparoscopic sigmoidectomy from 3 to 76 months before (mean, 40 months) or after CT-proven diagnosis of acute diverticulitis (unpublished data). The surgical technique consisted of a total removal of the sigmoid colon, with take-down of the splenic flexure and an anastomosis in the rectum distally to the reunion of the taenias. The results of the questionnaire showed that four patients (9%) complained of new abdominal pain. Bowel function was reported as better for 24 patients (56%), unchanged for 16 patients (37%), and worse for 3 (7%). Forty-one patients (95%) said that they would recommend the surgery. Functional results after laparoscopic sigmoidectomy could probably be improved by rigorous surgical technique removing all the sigmoid colon and by better selection of patients based on CT-proven diverticulitis.

Elective sigmoidectomy is mandatory for patients with complicated diverticulitis (stenosis and fistula) and reasonable for patients with symptomatic recurrent diverticulitis not responding to conservative means. For patients with uncomplicated diverticulitis, responsive to medical management, recommendations for sigmoidectomy should be based on age and number of acute attacks.

Reference

1. Ambrosetti P, Rohner A. De la diverticulose à la diverticulite: vol de nuit? Lyon Chir 1990;86:283–286.
2. Rao PM, Rhea JT, Novelline RA et al. Helical CT with only colonic contrast material for diagnosing diverticulitis: prospective evaluation of 150 patients. Am J Roentgenol 1998;170:1445–1449.
3. Werner A, Diehl SJ, Farag-Soliman N, Düber C. Multi-slice spiral CT in routine diagnosis of suspected left-sided colonic diverticulitis: a prospective study of 120 patients. Eur Radiol 2003;13:2596–2603.
4. Ambrosetti P, Grossholz M, Becker C, Terrier F, Morel Ph. Computed tomography in acute left-colonic diverticulitis. Br J Surg 1997;84:532–534.
5. Chautems RC, Ambrosetti P, Ludwig A et al. Long-term follow-up after first acute episode of sigmoid diverticulitis: is surgery mandatory? A prospective study of 118 patients. Dis Colon Rectum 2002;45:962–966.
6. Ambrosetti P, Jenny A, Becker Ch, Terrier F, Morel Ph. Acute left-colonic diverticulitis-Compared performance of computed tomography and water-soluble contrast enema. Dis Colon Rectum 2000;43:1363–1367.
7. Ambrosetti P, Becker C, Terrier F. Colonic diverticulitis: impact of imaging on surgical management. A prospective study of 542 patients. Eur Radiol 2002;12:1145–1149.
8. Aydin HN, Remzi FH. Diverticulitis: when and how to operate? Dig Liver Dis 2004;36:435–445.
9. Janes S, Meagher A, Frizelle FA. Elective surgery after acute diverticulitis. Br J Surg 2005;92:133–142.
10. Guller U, Jain N, Hervey S, Purves H, Pietrobon R. Laparoscopic vs open colectomy: outcomes comparison based on large nation-wise databases. Arch Surg 2003;138:1179–1186.
11. Wong WD, Wexner SD, Lowry A, et al. Practice parameters for the treatment of sigmoid diverticulitis. The Standards Task Force The American Society of Colon and Rectal Surgeons. Dis Colon Rectum 2000;43:290–297.
12. Stollman NH, Raskin JB. For and on *Ad Hoc* Practice Parameters Committee of the American College of Gastroenterology. Behalf of the Diagnosis and management of diverticular disease of the colon in adults. Am J Gastroenterol 1999;94:3110–3121.
13. Köhler L, Sauerland S, Neugebauer E. for the Scientific Committee of the European Association for Endoscopic Surgery Diagnosis and treatment of diverticular disease. Surg Endosc 1999;13:430–436.
14. Parks TG. Natural history of diverticular disease of the colon. A review of 521 cases. BMJ 1969;4:639–642.
15. Guzzo J, Hyman N. Diverticulitis in young patients: is resection after a single attack always warranted? Dis Colon Rectum 2004;47:1187–1190.
16. Anaya DA, Flum DR. Risk of emergency colectomy and colostomy in patients with diverticular disease. Arch Surg 2005;140:681–685.
17. Broderick-Villa G, Burchette RJ, Collins JC, Abbas MA, Haigh PI. Hospitalization for acute diverticulitis does not mandate routine elective colectomy. Arch Surg 2005;140:576–581.
18. Richards RJ, Hammitt JK. Timing of prophylactic surgery in prevention of diverticulitis recurrence: a cost-effectiveness analysis. Dig Dis Sci 2002;47:1903–1908.
19. Salem L, Veenstra DL, Sullivan SD, Flum DR. The timing of elective colectomy in diverticulitis: a decision analysis. J Am Coll Surg 2004;199:904–912.
20. Ambrosetti P, Chautems R, Soravia C, Peiris-Waser N, Terrier F. Long-term outcome of mesocolic and pelvic diverticular abscesses: a prospective study of 73 cases. Dis Colon Rectum 2005;48:787–791.
21. Thörn M, Graf W, Stefansson T, Pahlman L. Clinical and functional results after elective colonic resection in 75 consecutive patients with diverticular disease. Am J Surg 2002;183:7–11.
22. Munson KD, Hensien MA, Jacob LN, Robinson AM, Liston WA. Diverticulitis. A comprehensive follow-up. Dis Colon Rectum 1996;39:318–322.
23. Breen RE, Corman ML, Robertson WG, Prager ED. Are we really operating on diverticulitis. Dis Colon Rectum 1986;29:174–179.
24. Stevenson ARL, Stitz RW, Lumley J, Fielding GA. Laparoscopically assisted anterior resection for diverticular disease: follow-up of 100 consecutive patients. Ann Surg 1998;227:335–342.